

Adult Respiratory Distress Syndrome During Pregnancy and Immediately Postpartum

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From 1976 to 1983, the adult respiratory distress syndrome occurred in 14 patients during pregnancy or within a month postpartum. There were 8 survivors, giving a 43% mortality. All but 2 patients had obstetric-related precipitating events—labor problems, infections, eclampsia-toxemia, and obstetric hemorrhages. During emergency cesarean sections, 3 patients had respiratory problems that may have caused their respiratory distress syndrome. The average duration of mechanical ventilatory support was 16 days. Six patients had barotrauma with 1 patient sustaining an irreversible anoxic central nervous system injury. Infections were documented in 8 patients, 6 of whom had obstetric foci. There is a lack of information regarding the adult respiratory distress syndrome in this patient group. Though uncommon, it can cause substantial mortality and morbidity.

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The adult respiratory distress syndrome (ARDS) remains a serious medical problem.¹ It has substantial effects on young women who are pregnant or immediately postpartum,² causing their families to suffer as well. To understand conditions associated with ARDS in this patient group, we reviewed case records of patients we saw over a seven-year period (July 1976 through June 1983).

Patients and Methods

Daily patient admission logbooks from the respiratory and shock or trauma intensive care units of the LDS Hospital, Salt Lake City, Utah, were retrospectively reviewed to identify cases of ARDS occurring in female patients ages 17 to 45. The syndrome was defined by criteria reported by Ashbaugh and co-workers and modified to include pulmonary artery wedge pressures of less than 18 mm of mercury.³ The medical records of those who satisfied these screening criteria were reviewed to determine whether they were pregnant or if they had been delivered of a baby within a month of admission to our intensive care units (ICUs). Records of patients satisfying these criteria were further analyzed for demographic information, details of their obstetric history, preexisting remote or active medical or surgical conditions, acute obstetric and nonobstetric medical and surgical problems, the duration of mechanical ventilatory support, complications of care including infections, and mortality.

Results

A total of 14 cases of the adult respiratory distress syndrome were identified in this patient group (Table 1). There were eight survivors and six nonsurvivors, representing a 43% mortality rate for these patients. Nine patients were referred to our hospital for care after the onset of ARDS, and the other five received their initial obstetric care at our hospital. During this seven-year study period (1976 to 1983), there were 47,198 pregnancy-related admissions to our hospital.

The overall average age was 26 years, which was similar

to the average ages for both survivors and nonsurvivors. Most patients were in their mid-20s, with only two exceeding 30 years of age.

In all but three patients, ARDS developed in the last trimester of pregnancy. The average gestational age was 30 weeks. The survivors' average gestational age was 32 weeks versus 26 weeks for the nonsurviving group. Three (50%) nonsurvivors and two (25%) survivors had problems with previous pregnancies. One nonsurvivor apparently was unaware of her pregnancy. The average ratio of gravidity to parity was 3:1, with only four patients being primigravidas.

One survivor and three nonsurvivors had active medical problems. In two nonsurvivors, these problems—alcoholism and diabetes mellitus with hypertension—may have contributed to their acute obstetric problems.

The presumed causes of the adult respiratory distress syndrome are also listed in Table 1. For 12 patients (86%)—6 survivors and all 6 nonsurvivors—the initial problems were obstetric. These were evenly divided into four broad categories: labor problems, obstetric infections, eclampsia-toxemia, and hemorrhage. The major accompanying problems were respiratory complications—gastric aspiration (2 patients) and respiratory arrest (1; this patient also had abruptio placentae)—all anesthesia associated during emergency cesarean section, amnionitis, possible amniotic fluid emboli, and eclampsia. Only two patients received tocolytic therapy for premature labor. Both experienced one of the mentioned respiratory complications. Two patients (14%) initially had problems that were nonobstetric. One was a motor vehicle accident victim with facial and chest injuries, and the other had acute cholecystitis and pancreatitis that precipitated other problems, including eclampsia.

The duration of mechanical ventilatory support was

ABBREVIATIONS USED IN TEXT

ARDS = adult respiratory distress syndrome
ICU = intensive care unit

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TABLE 1.—Adult Respiratory Distress Syndrome (ARDS) in Young Pregnant or Postpartum* Women

Patient	Age, yr	G:P Ratio†	Gestation, wk	Preexisting or Previous Medical Conditions	Cause of ARDS	Ventilator Support, d	Infections or Complications (Treatment)
Survivors							
1	26	15:0 (Habitual abortions)	31	None	Acute cholecystitis-pancreatitis; eclampsia	14	Peritonitis and lesser sac abscess: <i>Escherichia coli</i> , <i>Candida</i> sp, <i>Staphylococcus epidermidis</i> (surgical drainage)
2‡	26	1:1	30	History of hookworm infestation, with dyspnea and hemoptysis	Toxemia, cesarean section; gastric aspiration during cesarean section	48	<i>Pseudomonas aeruginosa</i> bacteremia; sepsis × 2, necrotic uterus and pelvic abscess (hysterectomy and drainage of abscess); maxillary sinusitis, acute cholecystitis (sinus drainage and cholecystectomy); pneumothoraces × 10
3‡	31	3:2	17	None	Abruptio placentae, shock; amnionitis	7	Non-group A/B β -streptococcal endometritis and myometritis (hysterectomy, bilateral salpingo-oophorectomy); intracerebral hemorrhages × 2; acute renal failure
4‡	27	3:0 (Spontaneous abortion × 3)	35	History of heart murmur	Amnionitis	26	Non-group A/B β -streptococcal amnionitis, endometritis, and myometritis with uterine abscess and pelvic abscess (hysterectomy and right salpingo-oophorectomy); tension pneumothoraces
5	30	3:2	32	Hyperthyroidism; history of ovarian cysts	Premature labor, tocolytic therapy; abruptio placentae with uterine hemorrhage; shock and respiratory arrest during cesarean section	9	Endometritis, pelvic thrombophlebitis (exploratory laparotomy with hysterectomy and bilateral salpingo-oophorectomy); wound dehiscence
6‡	23	1:0	Term	None	Arrest of labor; cesarean section	22 (ECMO × 72 h)	Empyema (drained)
7‡	29	2:2	Term (home delivery)	None	Retained placenta with uterine hemorrhage, shock, and DIC; pneumonia	2	
8	20	1:0	32	None	Trauma (facial, chest contusions)	21	
Average . . .	26.5	≈4:1	32			≈19	
Nonsurvivors							
9‡	25	§	27 (estimated)	History of GI bleeding; alcoholism	<i>Bacteroides</i> sp bacteremia and sepsis due to endometritis; dental abscess	1	Endometritis; dental abscess; hepatic necrosis from herpes simplex type II hepatitis (abscessed tooth excised; hysterectomy, bilateral salpingo-oophorectomy); shock syndrome with hepatic failure, acute renal failure, and DIC
10‡	26	5:2	Term (postpartum)	Asthma	<i>E coli</i> endometritis; ? influenza	9 (ECMO × 8 d)	Endometritis; myocardial infarction; GI bleed; seizures; retroperitoneal hematoma (massive transfusion, 115 units RBCs); renal failure
11	26	2:0¶	24	Insulin-dependent diabetes mellitus; hypertension (being treated); esophageal strictures, previous esophageal rupture	Eclampsia	45	Multiple organ system failure; pulmonary fibrosis; recurrent pneumothoraces
12	28	3:2	30	None	Premature labor, tocolytic therapy; gastric aspiration during intubation for cesarean section	19	Anoxic brain injury due to shock caused by bilateral tension pneumothorax
13‡	21	1:0	29	None	Eclampsia	45	Multiple organ system failure; bilateral tension pneumothoraces
14‡	24	2:1	6	None	Spontaneous abortion; shock, ? amniotic fluid emboli	2	Shock; tension pneumothorax; DIC; renal and hepatic failure
Average . . .	25	3:1	26			≈20	
Group averages							
	≈26	3: < 1	29.5			19	

DIC = disseminated intravascular coagulation, ECMO = extracorporeal membrane oxygenation, GI = gastrointestinal, RBCs = erythrocytes [red blood cells]

*Within a month of delivery.

†Gravidity to parity ratio.

‡Transported to LDS Hospital for care.

§Patient was unaware of pregnancy; delivered of a 900-gram fetus a week before admission.

||Patient had 1 or more previous cesarean sections for a transverse lie.

¶Conceptus from previous pregnancy lost at 7 months.

similar for both groups, averaging 19 to 20 days. For the four nonsurvivors who did not die within one to two days, however, the mean duration of mechanical ventilatory support was 30 days—11 days longer than for the survivors. Of note, two patients were participants in an earlier national Extracorporeal Membrane Oxygenation Study.⁴ Six patients had barotrauma manifesting as tension pneumothoraces. The shock associated with this complication caused substantial irreversible anoxic brain injury in one patient. Several patients had more than one pneumothorax, necessitating the simultaneous use of multiple chest tubes.

Eight patients—six (75%) survivors and two (33%) nonsurvivors—had definable and treatable foci of infections either as an inciting event or as a complication of care. In the survivor group, four patients had obstetric foci of infection: three cases of amnionitis or endometritis and one of pelvic abscess. In the patient with a pelvic abscess, other distant foci of infection developed as well. Other infections in the survivor group included empyema and lesser sac abscess. Only two nonsurvivors had definable infections: both had endometritis from which one died acutely of septic shock. In two other nonsurvivors multiple organ system failure developed, but no septic foci were found.

The nonsurvivors were grouped into early and late (after two days of ICU care) deaths. The two patients in the early-death group died of fulminant shock syndromes, which included disseminated intravascular coagulation and hepatic and renal failure. Four patients were in the late-death group. One patient died on her ninth day in the ICU of sepsis, cardiac failure, and renal failure. While receiving extracorporeal membrane oxygenation, she was given a massive number of transfusions—115 units of packed erythrocytes—which may have contributed to her organ failures and death. On the 19th day in the ICU, life support was withdrawn from one patient who had sustained anoxic central nervous system injury from shock and hypoxemia associated with simultaneously occurring bilateral tension pneumothoraces. Two patients died on their 45th day in the ICU of irreversible respiratory failure associated with progressive multiple organ system failure. Only one autopsy was carried out in these six patients. The additional finding of hepatic necrosis from herpes simplex type 2 hepatitis was discovered in the first nonsurvivor (patient 9, Table 1).

Discussion

Although the respiratory distress syndrome in pregnant and immediately postpartum patients is uncommon, when it occurs, it is from clinical conditions associated with catastrophic events. These events are complex, with manifestations of multiple organ system involvement, but seem to stem primarily from obstetric problems and occur mainly in the last trimester of pregnancy.

Whether as an initial event or a complication of this event or care, infections contribute to the development of ARDS.^{5,6} Our results substantiate these findings and extend them to include obstetric patients. When infections are defined and treated, patients' survivability seems enhanced. This underscores the need to search intensively for sources of infection. As our experience shows, the initial search must include the pelvic structures for they were the source of 75% of the infections.

The causes of ARDS during pregnancy listed in this report are similar to those reported by others.^{7,8} Our report groups many of the various causes and notes their relative significance. Most problems (86%) were obstetric in origin and surprisingly evenly distributed over four categoric

groupings. For several patients, however, the accompanying problem may have been the main cause of ARDS, particularly where it was a respiratory complication. All of the accompanying respiratory problems occurred during anesthesia for emergency cesarean sections and accounted for 50% of all major accompanying events. Gastric aspiration was the most frequent respiratory complication. Because the morbidity and mortality from this disorder has remained unchanged over the past several decades, the risk factors for and the prevention and management of this problem need to be completely understood by physicians caring for these patients.⁹ Also, gastric aspiration is the most likely explanation for the two patients who received tocolytic therapy for premature labor. Recent evidence suggests that the pulmonary edema associated with tocolytic therapy is hydrostatic-pressure induced.¹⁰

Complications of prolonged mechanical ventilatory support were evident in our patients. Barotrauma was a recurrent problem that contributed to the death of at least one patient. This problem is currently neither predictable nor preventable. Physicians caring for patients receiving mechanical ventilatory support must be vigilant in anticipating this problem and possess the necessary skills to manage it.

The causes of our patients' deaths are categorically similar to those reported by Montgomery and associates.¹¹ Those patients who died within 72 hours of admission died of their presenting shock syndromes. The patients who died after 72 hours died of complications of their care or with various combinations of the sepsis syndrome; cardiac, renal, central nervous system, and hepatic dysfunction; or unremittent respiratory failure. Likewise, our patients' mortality rate (43%) is similar to that of other recently reported ARDS series.^{11,12} Unfortunately for this patient group, where the tragedy of losing a young mother may have far-reaching socioeconomic and developmental effects on a family, this rate is unacceptably high. As new therapeutic modalities and insights regarding the pathogenesis of ARDS are introduced into clinical medicine, mortality should be reduced. Our report suggests that some benefit might be realized by better control of the sepsis syndrome.

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